PATENT SPECIFICATION

NO DRAWINGS

943,595

943,595

Date of Application and filing Complete Specification Oct. 5, 1962.

No. 37824/62.

Application made in Netherlands (No. 270,116) on Oct. 10, 1961.

Complete Specification Published Dec. 4, 1963.

Index at acceptance:—Class C2 C2B41

International Classification:—C 07 c

COMPLETE SPECIFICATION

Preparation of Urea Prills

We, STAMICARBON N.V. a Dutch Limited Liability Company of 2 van der Maesenstraat, Heerlen, the Netherlands, do hereby declare the invention, for which we pray that a patent may be granted to us, and the method by which it is to be performed, to be particularly described in and by the following statement:—

The present invention relates to a process for preparing urea prills poor in biuret.

Urea prills are usually obtained by evaporating a urea solution resulting from a urea synthesis to a urea melt with a moisture content of, say, 2% by weight or less, and subsequently spraying this melt into the top of a prilling tower in which the drops fall freely in counter-current relation to cooling air so that the drops cool down and solidify into substantially spherical granules, the so-called urea "prills". If necessary, these prills are then subjected to a drying treatment.

Even when taking care to keep the temperature conditions in the evaporation process and the spraying of the urea melt as low as possible, and, to keep the residence times at the higher temperatures as short as possible, the amount of biuret in the prills and formed by thermal decomposition of urea according to the gross reaction $2\ CO(NH_2)_2 \rightarrow NH_2CONHCONH_2 + NH_3\uparrow$ is normally at least 0,6% by weight.

Biuret is poisonous to plants; if urea is to be used as a fertilizer for certain very sensitive plants, the urea must have a biuret content below 0.3% by weight.

Therefore, it has already been proposed to replace the evaporation of urea solutions to a urea melt by crystallization of urea; this gives practically biuret-free urea crystals, which can be subsequently melted for further processing into prills in the usual way. When preparing the urea melt in this way prills can be obtained which contain 0.3—0.5% biuret, depending on the perfection of the melting process.

[*Price 4s. 6d.*]

The object of the invention is to enable prills with a still lower biuret content to be prepared.

According to the invention urea crystals obtained from a urea solution by crystallization are heated to produce a melt which still contains urea crystals, the melt is divided into drops containing such crystals and the drops are solidified into prills.

The crystals should be melted to give a highly fluid crystal suspension. The crystals must be sufficiently fine to permit the suspension to be divided into drops as required, e.g. by spraying. It is recommended that the crystal sizes be not more than 500μ. Suspensions of urea crystals in molten urea with a content of solid urea of up to 30% by weight can still be very readily processed into prills.

The melting of crystals may be performed continuously in a heating device to which crystals are continuously fed and from which suspension continuously discharges. Ammonia may be fed in to the melting stage to inhibit or retard biuret formation.

The process according to the invention offers the following advantages over the process in which the whole crystal mass is melted:—

a. The amount of heat required in the melting is less, since not all the crystals need be melted consequently. The time for melting the urea crystals may be less and/or the temperature during melting may be a few degrees lower.

b. The biuret formation is less due to the shorter melting time and/or lower melting temperature. Biuret forms only in the melt, i.e. in the liquid part of the suspension to be processed.

c. Less cooling air is needed for flowing through the prilling tower, as less heat is released during the solidification of the drops.

d. The losses of ammonia sustained during

spraying of the suspension and solidification of the drops in their fall through the prilling tower are lower.

The advantages are already in evidence if the urea suspension to be processed contains only 5% by weight of solid urea, but the higher the content of solid urea in the melt, the more pronounced the said advantages become.

The following specific example gives an idea of the advantages to be obtained.

EXAMPLE

Urea crystals obtained from a urea solution by crystallization with attendant removal of a mother liquor rich in biuret, and having themselves a biuret content of 0,08% by weight are continuously fed by a metering device into a steam-heated circulation conduit, in which the circulation is maintained by a pump. The molten urea is continuously discharged from this conduit. During the melting process some NH_3 is also fed into the circulation conduit, in an amount of about 0,4% of the urea supplied, with a view to retarding the biuret-formation reaction. At a mean residence time of 3 minutes and a temperature of the melt of 135° C. the homogeneous melt discharged has a biuret content of 0.33% by weight. The heat consumption amounts to 65 gcal/g of urea. The increase of biuret is 0.25% by weight.

If the process according to the invention is carried out with continuous discharge of a suspension containing 20% by weight of solid urea, the temperature of the melt is 133° C., the mean residence time 2½ minutes, the heat consumption 52 gcal/g of product and the increase of biuret 0.10% by weight.

WHAT WE CLAIM IS:—

1. A process for preparing urea prills poor in biuret wherein urea crystals are heated to produce a melt which still contains urea crystals, the melt is divided into drops containing such crystals and the drops are solidified into prills.

2. A process according to claim 1, wherein the melting process is carried out continuously, i.e. with a continuous feed of urea crystals and a continuous discharge of suspension.

3. A process according to claim 1 or 2, wherein ammonia is fed in to inhibit or retard biuret formation during the melting.

4. A process for preparing urea prills poor in biuret, substantially according to the example herein.

5. Urea prills when prepared by a process according to any of the preceding claims.

HYDE & HEIDE,
3, Liverpool Street,
London, E.C.2,
Chartered Patent Agents for the Applicants.

Leamington Spa: Printed for Her Majesty's Stationery Office by the Courier Press.—1963.
Published at The Patent Office, 25, Southampton Buildings, London, W.C.2, from which copies may be obtained